

CLAIMS

Therefore, having thus described the invention, at least the following is claimed.

- 1 1. A microstructure, comprising:
2 a substrate;
3 an overcoat layer disposed upon the substrate;
4 an air-region within at least a portion of the overcoat layer; and
5 a framing material layer engaging at least a portion of the air-region on
6 an inside surface of the framing material layer, and engaging the overcoat layer
7 on an outside surface of the framing material layer.

- 1 2. The microstructure of claim 1, wherein the overcoat layer is selected from
2 polyimides, polynorbornenes, epoxides, polyarylenes ethers, polyarylenes,
3 inorganic glasses, and combinations thereof.

- 1 3. The microstructure of claim 1, wherein the framing material is selected from
2 SiO₂, Si₃N₄, SiO_xN_y (where x is from 0.01 to 2 and y is from 0.01 to 1.33), and
3 Al₂O₃.

- 1 4. The microstructure of claim 1, wherein the air-region has a height from about
2 0.01 to 100 micrometers and a width of about 0.1 to 10,000 micrometers.

- 1 5. The microstructure of claim 1, wherein the framing material has a thickness of
2 about 0.001 to 10 micrometers.

- 1 6. The microstructure of claim 1, wherein the framing material has a thickness of
2 about 0.01 to 2 micrometers.

- 1 7. The microstructure of claim 1, further comprising a plurality of air-regions
2 disposed within the overcoat layer, the framing material layer of each of the
3 plurality of air-regions engaging at least a portion of each air-region on the
4 inside surface of the framing material layer and engaging the overcoat layer on
5 the outside surface of the framing material layer.
- 1 8. The microstructure of claim 7, wherein the air-regions are positioned at
2 multiple height levels within the overcoat layer.
- 1 9. The microstructure of claim 8, wherein a first air-region is positioned above
2 and substantially in-line with a second air-region.
- 1 10. The microstructure of claim 8, wherein a first air-region is positioned above
2 and substantially offset from a second air-region.
- 1 11. A microstructure, comprising:
2 a substrate;
3 an overcoat layer disposed upon the substrate;
4 a sacrificial polymer layer disposed within at least a portion of the
5 overcoat layer; and
6 a framing material layer engaging at least a portion of the sacrificial
7 polymer layer on an inside surface of the framing material layer and engaging
8 the overcoat layer on an outside surface of the framing material layer.
- 1 12. The microstructure of claim 11, wherein the overcoat layer is selected from
2 polyimides, polynorbornenes, epoxides, polyarylenes ethers, parylenes,
3 inorganic glasses, and combinations thereof.
- 1 13. The microstructure of claim 11, wherein the framing material is selected from
2 SiO₂, Si₃N₄, SiO_xN_y (where x is from 0.01 to 2 and y is from 0.01 to 1.33), and
3 Al₂O₃.

- 1 21. The method of claim 18, wherein the framing material is selected from SiO_2 ,
2 Si_3N_4 , SiO_xN_y (where x is from 0.01 to 2 and y is from 0.01 to 1.33), and
3 Al_2O_3 .
- 1 22. The method of claim 18, wherein the sacrificial layer polymer is selected from
2 polyimides, polynorbornenes, epoxides, polyarylenes ethers, polyarylenes,
3 inorganic glasses, and combinations thereof.
- 1 23. A method for fabricating a microstructure, comprising:
2 providing a structure having a substrate, an overcoat layer, a sacrificial
3 polymer layer in an area within the overcoat layer, and a framing material
4 between at least a portion of the sacrificial polymer layer and the overcoat
5 layer; and
6 removing the sacrificial polymer layer to form an air-region within the
7 area defined by the sacrificial material.
- 1 24. The method of claim 23, wherein the sacrificial layer polymer is solvent-
2 incompatible with the overcoat.

- 1 14. The microstructure of claim 11, wherein the sacrificial layer polymer is
2 selected from polyimides, polynorbornenes, epoxides, polyarylenes ethers,
3 parylenes, inorganic glasses, and combinations thereof.
- 1 15. The microstructure of claim 11, wherein the sacrificial layer polymer is solvent
2 incompatible with the overcoat.
- 1 16. The microstructure of claim 11, wherein the sacrificial layer polymer has a
2 height from about 0.01 to 100 micrometers and a width of about 0.1 to 10,000
3 micrometers.
- 1 17. The microstructure of claim 11, wherein the framing material has a thickness
2 of about 0.001 to 10 micrometers.
- 1 18. A method for fabricating a microstructure, comprising:
2 providing a substrate having a sacrificial polymer layer disposed
3 thereon;
4 disposing a framing material onto at least a portion of the sacrificial
5 polymer layer; and
6 disposing an overcoat layer onto the framing material, wherein the
7 framing material substantially separates the sacrificial polymer layer from the
8 overcoat layer.
- 1 19. The method of claim 18, further comprising:
2 removing the sacrificial layer to define an air-region within the
3 overcoat layer, the framing material engaging at least a portion of the air-
4 region on an inside surface of the framing material and engaging the overcoat
5 layer on an outside surface of the framing material.
- 1 20. The method of claim 18, wherein the overcoat layer is selected from
2 polyimides, polynorbornenes, epoxides, polyarylenes ethers, parylenes,
3 inorganic glasses, and combinations thereof.